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its volume is always above a certain minimum due to an artesian supply. The formations of the valley are the Santa Fé, composed of conglomerates and intercalated lava flows, and the Alamosa, a lake deposit, which, because of its sand beds interstratified with a series of blue clays, satisfies the necessary conditions for an artesian circulation.

Most of the waters from the streams sink into the alluvial fans soon after they enter the valley, and this furnishes the water supply for the aquifers. If all the waters entering the valley were used for irrigation, it is estimated that 20,000-25,000 acres could be made productive. Most of the 3,234 wells in the valley are flowing, and a large number are used primarily for irrigation. They are described by localities; many records and twenty analyses of the waters are given. A peculiarity of the wells in the trough of the valley is the presence of small amounts of gas and brownish-colored water due, respectively, to vegetable accumulations and alkali deposits in the Alamosa formation, formed during an arid time when the lake was much shrunken. Springs are not uncommon, and of these several are of the thermal type. The accompanying topographic map shows the limits of the flowing wells, the gas field, and the colored waters.

A. E. F.

The Origin of the Thermal Waters in the Yellowstone National Park.

By ARNOLD HAGUE. *Science, N.S.*, XXXIII, 1911, 553-68.

The conditions of the region are such as could give rise to springs. The gases escaping from the waters and the substances held in solution could be derived from the rocks traversed, and they vary in composition according to the chemical nature of the rocks through which they ascend. For these reasons it seems that these thermal waters have a meteoric origin. Of interest is the clear explanation offered for considering a geyser but one phase in the development of some hot springs.

A. E. F.

Reconnaissance of the Geology and Mineral Resources of Prince William Sound, Alaska. By U. S. GRANT and D. F. HIGGINS.

Bull. 443, U.S. Geol. Survey. 1910. Pp. 89; figs. 9; pls. 12.

The two divisions of the sedimentary rocks are the Valdez and the Orca groups, both of which are closely folded, and the latter lies unconformable on the former. Basic flows of greenstone, ellipsoidal in many places, are so intimately interstratified with the Orca, that they are discussed as a part of that group. Granitic bosses and dikes of diabase,

gabbro, diorite, and aplite intrude the sedimentaries. The petrography of the igneous rocks is rather detailed for a reconnaissance report.

Sheared zones occur in the greenstone, and these carry important copper values, the only mineral of importance being chalcopyrite. Practically no oxidized zones are found. Auriferous quartz veins also occur in the region, and one gold mine is in operation. A. E. F.

Geology and Mineral Resources of the Solomon and Casadepaga Quadrangles, Seward Peninsula, Alaska. By PHILIP S. SMITH. Bull. 433, U.S. Geol. Survey. 1910. Pp. 234; figs. 26, pls. 16.

This bulletin is the first of a series to describe in detail the geology of Seward Peninsula. The results of reconnaissance work for the whole peninsula are discussed, to give a general setting, and then the detailed geology of these two quadrangles is described. The rocks of the region are of sedimentary and igneous origin, practically all of which are highly metamorphosed. The metamorphosed sediments consist of the Solomon schist (pre-Ordovician [?]), the Sowik limestone (Ordovician [?]), the Hurrah slate (post-Ordovician [?]), and the Puckmummie schist (post-Ordovician). The metamorphosed igneous rocks are the Casadepaga schist, and greenstones. After the intense diastrophic movements that affected these rocks, others were deposited and intruded. Of the later sediments, but very small amounts of a conglomerate are left, and the igneous rocks consist of granitic and basic intrusives, none of which cover any considerable area. Unconsolidated deposits of recent age are found as stream gravels, high level gravels, and in the coastal plain.

This region is of economic importance because of its gold production. Auriferous quartz veins are numerous, but their values have been such that only one mine has ever been on a paying basis. The most important veins are largely limited to the Hurrah slate, and the contact of the Sowik limestone and the Solomon schist. By far the largest production has been from placers in the river gravels, and the locations of the ones where the best values are recovered is down stream from the outcrops of the Sowik limestone. A few dredges are in operation, and they have been very profitable. A. E. F.

The Copper Handbook, Vol. X, 1910-11. By HORACE J. STEVENS. Houghton, Mich., 1911.

As in the past, the work contains condensed information regarding all the known copper mines of the world, giving a sketch of the financial